REMARKS

Upon entry of the present reply, claims 1, 4-10, 13-16, 20-26 will be pending in the present patent application. Claims 1, 15, and 20, have been amended to further clarify the claimed invention, support for which can be found, *inter alia*, throughout the specification (e.g., page 5, lines 9 to 26). Claims 4, 5, 16, 25, and 26 have been amended to address typographical errors.

Claims 1, 4-10, 13-16, 20-26 have been rejected under §112, ¶2 as being allegedly indefinite and failing to set forth the subject matter which applicants regard as their invention. Claims 1, 4-10, 13-16, 20-26 have also been rejected as allegedly obvious in light of U.S. Patent No. 6,211,113 (Harth) in view of U.S. Patent No. 5,240,894 (Burkhardt) and U.S. Patent Application Pub. No. 2002/0013217 (Herrmann).

The objection was maintained against the drawings for allegedly including reference signs that were not mentioned in the specification.

An objection to the abstract of the disclosure was raised for the alleged repugnant use of the term "insulate."

The present invention is directed to supported catalysts for producing a syndiotactic styrenic polymer, which comprise a support layer, a polymer layer coated onto the support layer, and a catalyst layer wherein the polymer layer is located between the support layer and the metallocene catalyst layer such that the polymer layer insulates the metallocene layer from the support layer to prevent poisoning of the metallocene catalyst layer by the support layer.

The present invention also is directed to methods of preparing a supported catalyst for producing a syndiotactic styrenic polymer, the methods comprising providing a slurry comprising a support, a polymer to be coated onto the support, and a solvent; coating the support with the polymer; drying the slurry; and adding a metallocene catalyst and a solvent to the dried slurry to create a supported catalyst such that the polymer is located between the support and the catalyst.

Objection to the Drawings

Applicants respectfully traverse the objection to Figure 1 for allegedly including reference signs that were not mentioned in the specification. In response to the same objection raised in the March 18, 2003 Office Action, Applicants submitted a replacement for the paragraph beginning at line 10, page 5 in their the June 18, 2003 reply. This replacement paragraph states "Fig. 1 is a schematic drawing illustrating insulation concept of the supported catalyst according to the present invention by the insulation layer of polymer 2 between the support 1 and the metallocene catalyst 3." Because reference signs shown in Figure 1 are included in the specification, as amended, Applicants request that the objection to the drawings be reconsidered and withdrawn.

Objection to the Abstract

Applicants respectfully disagree with the allegation in the Office Action that "the term 'insulate' is still present with a meaning contrary to the accepted meaning of the term." In an effort solely to advance prosecution of the present application, however, Applicants have replaced the old Abstract with a new Abstract. A replacement sheet for the Abstract is also submitted with this reply. The replacement abstract further describes the relative locations of the catalyst layers and further explains that insulating the metallocene layer from the support layer prevents poisoning of the metallocene catalyst layer by the support layer.

35 U.S.C. § 112 ¶2 Rejections

Claims 1, 4-10, 13-16, 20-26 have been rejected under §112, ¶2 as being allegedly indefinite and failing to set forth the subject matter which applicants regard as their invention. The Office Action alleges that "the claims as currently drawn lack the particular order of layers." Claims 1, 15, and 20 have been amended to recite that the polymer is located between the support and the catalyst. Applicants request, therefore, that the rejection "that claims fail to correspond in scope with that which applicants regard as the invention" be reconsidered and withdrawn.

With respect to the § 112 ¶2 rejections directed to claims 4, 5, and 16, the claims have been amended to address typographical errors. In addition, the dependencies of claims 25 and 26 have been amended.

Further, the Office Action alleges that "[i]n claim 15, without the presence of a cocatalyst, what is made instead is merely a supported catalyst precursor." Applicants respectfully disagree. Claim 15 has been amended to clarify the process of making a supported catalyst, the steps including providing a slurry comprising a support, a polymer to be coated onto the support, and a solvent; coating the support with the polymer; drying the slurry; and adding a metallocene catalyst and a solvent to the dried slurry to create a supported catalyst such that the polymer is located between the support and the catalyst. Accordingly, Applicants request reconsideration and withdrawal of the rejection.

35 U.S.C. § 103 Rejection

Claims 1, 4-10, 13-16, 20-26 have been rejected as allegedly obvious over Harth in view of Burkhardt and Herrmann. Applicants respectfully traverse this rejection, as none of the cited references, either alone or in combination, teach or suggest Applicants' claimed invention. Furthermore, none of the cited references provide the required art-suggested motivation for modifying their teachings in such a way as to obtain Applicants' claimed invention.

The present invention claims supported catalysts and methods of making supported catalysts for use in the preparation of syndiotactic styrenic polymers. The supported catalyst claims have been amended to more clearly define the ***polymer layer***, located ***between*** the support layer and the catalyst layer, which insulates the metallocene catalyst layer from the support layer to prevent poisoning of the catalyst layer by the support layer.

According to the Office Action, "Harth lacks disclosure of using [its intermediate] layer structure with a metallocene catalyst." The Office Action then mistakenly alleges that "it would have been obvious to one of ordinary skill in the art to apply the teachings of Burkhardt and Herrmann to the disclosure of Harth ...". To remedy Harth's deficiency, the Office Action asserts that one skilled in the art would apply the metallocene catalysts used in

olefin polymerizations of Burkhardt and Herrmann to the teachings of the Harth catalysts, which are used for non-steady state, heterogeneously catalyzed processes.

Harth, Burkhardt, and Herrmann all fail, however, either alone or in combination, to teach or suggest a ***polymer layer***, located ***between*** the support layer and the catalyst layer as claimed by the present invention. As such, applying the teachings of Harth to either Burkhardt or Herrmann fails to arrive at Applicants' instant invention.

Harth discusses "catalyst beds for non-steady state processes, " such as a Deacon process (preparation of Cl_2 from HCl), and "coated catalysts for non-steady state, heterogeneously catalyzed processes which are composed of a support, an intermediate layer and generally at least one active layer." (Col. 1, lines 1-7). The intermediate layer according to Harth "comprises at least one nitride, oxide, carbide or chloride of a metal." (Col. 2, lines 5-7). Harth, therefore, fails to teach or suggest a ***polymer layer***, located ***between*** the support layer and the catalyst layer as claimed by the present invention.

Burkhardt also falls short of providing either a teaching or suggestion of a ***polymer layer*** located ***between*** the support layer and the catalyst layer. Burkhardt discloses a "method for making and using a supported metallocene catalyst system." The catalyst product provided by the process of Burkhardt "may optionally be prepolymerized with an olefin to impart improved catalyst particle strength" (Col. 3, lines 45-47) and enhance particle size control of the final polymer (Col. 7, lines 31-33). The metallocene layer of Burkahrdt, thus, is supported *directly* on dehydrated silica to form a supported catalyst, and thereafter, the supported catalyst may be prepolymerized with an olefinic monomer. (Col. 3, lines 39-43; Col. 4, lines 39-40) (emphasis added). Burkhard, therefore, conspicuously lacks a ***polymer layer***, located between the support layer and the catalyst layer.

Further, like Harth and Burkhardt, Herrmann fails to provide either a teaching or suggestion of a ***polymer layer*** located ***between*** the support layer and the catalyst layer. Herrmann discusses "catalyst for the polymerization of olefins, process for its preparation and its use." Herrmann merely provides a supported catalyst using a process of "reacting the reaction product formed from an aluminoxane and at least one metallocene with a microporous, polymeric support." (par. [0010]). The polymer of Herrmann, therefore, is *only* contacted with a catalyst (e.g., pars. [0010, 0157, 0158]). In fact, the catalyst discussed by Herrmann comprises one layer in that all starting components are simultaneously reacted

with one another (e.g., pars. [0158]). Hermann, therefore, fails to teach or suggest a ***polymer layer***, located ***between*** the support layer and the catalyst layer.

Not only does the Office Action fail to provide a combination of references that teaches or suggests the claimed invention, it also fails to provide the requisite art-suggested motivation to combine the references. In this regard, the Office Action mistakenly asserts that "one of ordinary skill in the art would have recognized that the support materials of Herrmann would have served as well as intermediate layer materials between the supports specifically disclosed by both Burkhardt and Harth and the metallocenes of both Burkhardt and Herrmann." One skilled in the art of making catalysts suitable for making syndiotactic styrenic polymers, however, would *not* look to, or be motivated to combine, a catalyst according to Harth, suitable for, e.g., a Deacon process, with a catalyst suitable for polymerization of olefins according to either Burkhardt or Herrmann because the requirements for the Deacon-type of catalysts typically differ substantially from the requirements of the olefin catalysts. Furthermore, neither Harth nor Burkhardt nor Herrmann recognizes, teaches, or even suggests that a support layer could be poisonous to a catalyst layer. Accordingly, the Office Action has not provided evidence that one skilled in the art, if presented with Harth, Burkhardt, and Herrmann at the time the present application was filed would have been motivated to combine any of these references in such a way as to arrive at Applicants' claimed invention.

Applicants respectfully assert that the Office Action merely engages in an improper limitation-by-limitation, reference-by-reference analysis to find the present claims obvious. *In re Dembiczak*, 175 F.3d 994, 999 (Fed. Cir. 1999) (noting that a mere "reference-by-reference, limitation-by-limitation analysis ***fails*** to demonstrate how" the prior art references would be combined to create the present invention) (emphasis added).

Nothing in the cited art teaches or suggests a ***polymer layer***, located ***between*** the support layer and the catalyst layer. Moreover, the Office Action has failed to identify any teaching in any of the cited reference that provides the art-suggested motivation to combine the references in such a way as to obtain Applicants' claimed invention. Accordingly, the Office Action has failed to establish *prima facie* obviousness. Applicants request, therefore, that the 35 U.S.C. § 103 rejection based on Harth in view of Herrmann and Burkhardt be reconsidered and withdrawn.

In light of the foregoing, Applicants assert that the foregoing constitutes a complete and full response to the Office Action of record. Furthermore, it is respectfully submitted that this application is in condition for allowance. Accordingly, an indication of allowability and an early Notice of Allowance are respectfully requested. The examiner is invited to contact the undersigned at (215) 557-5965 to clarify any unresolved issues raised by this reply.

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ABSTRACT

(Replacement Sheet)

The supported catalyst according to the present invention comprises a support of organic or inorganic powder with a high-surface area, a polymer coated onto the support and a metallocene catalyst. The polymer (1) contains polar groups; (2) interacts with the surface of the support; and (3) is insoluble in the styrenic monomer or polymerization solvent during polymerization after the catalyst is loaded. The polymer is located between the support and the metallocene catalyst such that the polymer insulates the metallocene layer from the support layer to prevent poisoning of the metallocene catalyst layer by the support layer. The styrenic polymer powder such produced by the present invention has good flow-ability and good morphology demonstrating a great deal of industrial applicability.